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UNDERWATER INSPECTION OF FLEET MOORINGS.(U)
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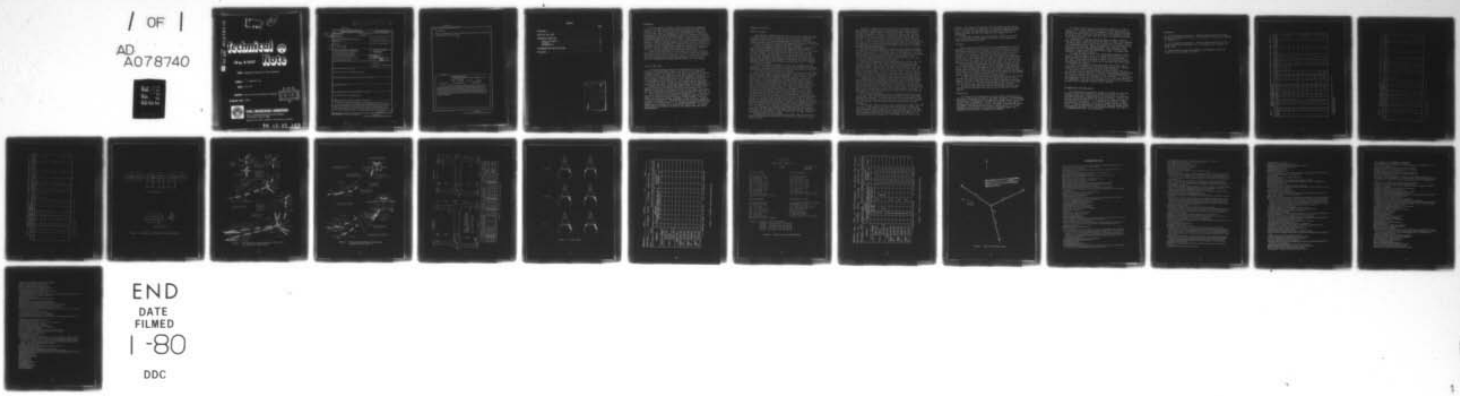

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Technical Note

CEL

TN no. N-1557

title: UNDERWATER INSPECTION OF FLEET MOORINGS

author: J. F. Wadsworth III

date: July 1979

sponsor: Naval Facilities Engineering Command

program nos: 03-006

CIVIL ENGINEERING LABORATORY
NAVAL CONSTRUCTION BATTALION CENTER
Port Hueneme, California 93043

(9) Final rept. Mar-Sep 78,

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
(14) 1. REPORT NUMBER CEL-TN-1557	2. GOVT ACCESSION NO. DN787079	3. RECIPIENT'S CATALOG NUMBER
(6) 4. TITLE (and Subtitle) UNDERWATER INSPECTION OF FLEET MOORINGS		5. TYPE OF REPORT & PERIOD COVERED Final; Mar 78 - Sep 78
		6. PERFORMING ORG. REPORT NUMBER
(10) 7. AUTHOR(s) J. F. Wadsworth, III		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS CIVIL ENGINEERING LABORATORY Naval Construction Battalion Center Port Hueneme, California 93043		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 03-006-O&MN
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Facilities Engineering Command Alexandria, Virginia 22332		(11) 12. REPORT DATE July 1979 (12) 26 13. NUMBER OF PAGES 22
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Underwater inspection, mooring maintenance.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report is a guide for divers engaged in underwater inspections of the Navy's Fleet moorings. These inspections are conducted to report the physical condition of the moorings. Engineering and maintenance assessments are made by engineers using the inspection data. Procedures and equipment to be used by the diver are given. Forms for documentation of the data with examples are included. It is strongly recommended that the diving inspection

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Civil Engineering Laboratory
UNDERWATER INSPECTION OF FLEET MOORINGS (Final),
by J. F. Wadsworth III
TN-1557 22 pp illus July 1979 Unclassified

1. Fleet moorings 2. Moorings (inspection) I. 03-006 (O&MN)

This report is a guide for divers engaged in underwater inspections of the Navy's Fleet moorings. These inspections are conducted to report the physical condition of the moorings. Engineering and maintenance assessments are made by engineers using the inspection data. Procedures and equipment to be used by the diver are given. Forms for documentation of the data with examples are included. It is strongly recommended that the diving inspection team be accompanied by the engineer responsible for writing the report recommending maintenance actions on the moorings.

CONTENTS

BACKGROUND

The first effort to perform a detailed quantitative underwater inspection of fleet moorings was made by the Underwater Construction Team Two (UCT TWO) assisting the Civil Engineering Laboratory (CEL) at Apra Harbor, Guam, in January of 1977 (reference (1)). Inspection procedures and forms were developed to enable UCT TWO divers to perform the hardware inspection and record the data. Interpretation of the data and reporting were done by CEL. The inspection was successful, however, further refinement of the procedures, tools, and documentation was deemed necessary. When UCT TWO was requested to conduct mooring inspections in San Diego, UCT TWO approached CEL to provide assistance and to write the inspection report. The inspection procedures, results, and analysis of the data for the San Diego fleet moorings are documented in reference (2). This work was funded by San Diego Public Works Center.

Recently the Ocean Engineering and Construction Office (FPO-1) of Chesapeake Division, Naval Facilities Engineering Command was given the lead to establish uniform procedures, criteria, and type specifications for mooring inspection and condition assessment. As a part of this work the Fleet Mooring Maintenance Manual, MO-124 will be updated.

OBJECTIVE AND SCOPE

CEL received requests from various Engineering Field Divisions (EFD's), Public Work Centers (PWC's) and the UCT's for guidance in underwater inspection of moorings. This report was prepared in response to those requests. This report provides the procedures, equipment, and the data recording format used to conduct underwater inspections of fleet moorings. These guidelines are of an interim nature and will be superceded by the revised MO-124. These guidelines are applicable to the inspecting divers at each station, whether they be Underwater Construction Team (UCT), Public Works Center (PWC), or contracted divers.

Normally the divers making the inspection will only report the physical condition of the mooring based on the guidelines given. In addition to the checks to be made as listed in this report, the customer may require additional information to assess the mooring's condition.

The role of the diver in underwater inspections is 1) to acquire the data on the condition of the mooring or underwater structure and 2) to record and compile the data for delivery to the customer. The diver should not be expected to make assessments of the structural integrity or safety of the mooring. These must be carried out by the engineer who analyzes the inspection data. It is strongly recommended that the customer have this engineer on site during the inspections. In this way the engineer can recognise the need for and request additional data when necessary.

UNDERWATER INSPECTION

General Procedure

The inspections performed by the UCT's are a quick, economical means of establishing the general condition of moorings. This information is suitable for decisions of maintenance (defer or expedite scheduled overhauls) and classification (downgrading rated capacity of a mooring). A more detailed inspection should be performed upon recovery of the mooring to establish the specific overhaul maintenance required.

Before an underwater inspection can begin, drawings or parts list of each mooring are required to perform the inspections expeditiously. These documents should be updated by the responsible PWC, EFD, or activity with each overhaul to ensure they reflect the current mooring design. If these documents are available and up to date, the divers can make simple, fast "go no-go" measurements to establish mooring condition. If they are not available, the divers must spend their time making actual physical measurements of the components to establish "as built" drawings and parts lists. Due to restrictions on bottom time, this is a lengthy and expensive procedure.

A selective sampling approach is taken to the underwater mooring inspection. Areas which are known to corrode or wear rapidly are checked. Comparing the drawings and parts list to design requirements and mooring classification pinpoints other areas of concern.

The inspection consists of measuring the chain and connecting hardware to determine the amount of corrosion and wear. Chain which is less than 90% of original diameter should be downgraded in classification; chain which is less than 80% of original should be excessed. Single link measurements on the wire diameter of a single A-link detect corrosion loss; double link measurements made where two A-links contact detect wear. Single link measurements are made on three different diameters on the same approximate cross-section. The double link measurements are made on three adjoining links (Figure 1). Each riser-type mooring is inspected by making the following caliper measurements: (1) single and double link measurements on the riser just under the buoy, halfway to the ground ring, and just above the ground ring; (2) single link measurements on the ground ring; (3) single and double link measurements on each ground leg just below the ground ring and at the wearpoint (where the chain is picked up and set down on the bottom by tides and waves). Anchor joining links connecting the ground legs to the ground ring should be visually checked but not measured. In addition, an underwater voltmeter should be used to obtain corrosion potentials at each inspection point. This is mandatory if the mooring is cathodically protected, optional if it is not. The anodes on cathodically protected moorings should also be inspected. Any dull powder on the anodes should be removed. Measurements or estimates of the amount of anode remaining should be made. Measure the corrosion potential of the anode.

Telephone-type moorings should be given single link, double link and potential measurements on each leg at the wearpoint, midpoint, and just below the buoy.

The general orientation of each leg can be obtained by finding the angle between a landmark and the diver's bubbles or a marker float at the end of each ground leg with a horizontal sextant. Alternatively a hand-bearing compass or pelorus may be used by sighting over the buoy from the marker float or bubbles. Using the compass on the buoy is not advisable as considerable compass deviation may be induced. The buoy position, as shown on the charts, should be checked to detect dragging. This may be done from the buoy by using sextant sights or compass bearings of landmarks or a precision positioning system such as the Mini-Ranger. The buoy position may also be fixed from shore using transits or compass bearings from charted benchmarks.

The anchors usually cannot be inspected as they are buried beneath the seafloor. The divers should swim out the ground leg until it becomes buried in the seafloor. The sketches given for each mooring in the data sheets therefore do not give actual lengths of the ground legs or bearings to anchors but depend upon the tautness of the ground leg for the overall accuracy of the bearings. These sketches should be taken only as a general indication of the mooring layout.

The buoy is inspected by noting fender condition, fouling, wear and corrosion on connecting links, need for cleaning and recoating, and collision damage. Valves and junction boxes on telephone-type buoys should be checked. Some of the riser type buoys have hawse pipes. One particular area to check on this type buoy is that portion of the riser chain in the hawse pipe. This can be done by using a crane to lift up on the riser and connecting links on top of the buoy. The condition of the rubbing casting at the bottom of the hawse chain should be noted and single and double link measurements should be made on the hawse chain.

Inspections can be carried out with SCUBA or surface-supplied gear. At San Diego both MK1 (bandmask) and SCUBA were tried; SCUBA went faster. One diver carried a chipping hammer and the calipers; the second diver carried the voltmeter and the inspection form taped to a slate. Diver 1 would clear growth and corroded materials, make caliper measurements and signal results to diver 2. Diver 2 would record results on the inspection form (printed on waterproof paper) and then take voltmeter readings. In this manner a 3-leg riser type mooring in about 40-60' of water could be inspected in 40 to 60 minutes.

If visibility becomes very poor MK1 is probably the best way to do inspections. The diver would then call his results to the surface where they would be recorded. With low visibility it may be necessary to have the diver tie off each leg with a small piece of line as it is inspected, this will provide a tactile marking of which legs have already been inspected.

For moorings in depths beyond practical working dive range, typically 120 feet, a crane barge may be used to lift the mooring so divers can check the ground ring and upper sections of ground legs. This was done during the Apra Harbor inspection and allowed the PWC riggers to perform buoy maintenance while the mooring was inspected (reference (1)). A crane barge will also be necessary if the ground ring is buried in the

seafloor. The crane (or winch) must lift the ground ring free of the bottom to allow divers to inspect the ring and the attached ground legs. This is necessary as these components are those most subject to wear. Properly designed moorings will always have the ground ring off the seafloor.

If the riser is raised it must be securely tied off to a strong point on the barge, before inspected by divers. Do not depend on a crane or winch to hold the load.

Equipment

Tables 1 and 2 give the 80 and 90 percent measurements for mooring components for each type of mooring class. These tables are based on the standard moorings listed in DM-26, reference 3, (Figures 2 and 3). The tables can be used to preset calipers for the various items to be inspected. For example, a class BB riser type mooring will require calipers set to 3.15" (90%) and 2.80" (80%) for single link measurements on the riser; 6.30" (90%) and 5.60" (80%) for double link on the riser; 2.25" and 2.00" for single link on the ground legs; 4.50" and 4.00" for double link on the ground legs; and for the ground ring 5.85" and 5.20".

When adjustable calipers were used at San Diego, they were preset with a vernier caliper then taped to prevent movement of the adjusting screw. The preferred measurement device is the back-to-back 80 and 90 percent gage configuration (Figure 4.) These gages eliminate the need for setting calipers before diving and checking and resetting them between dives. Chances of knocking the adjustment off the setting are eliminated, and the number of calipers to carry is reduced by half.

To insure the diver could distinguish each caliper, visual and tactile markings were placed on each caliper to indicate what part it was to measure. Tape was wrapped around the calipers to provide the necessary markings (Figure 5). The same coding was used on the single and double link calipers as they are easy to distinguish by their settings.

The back-to-back gages are easier to identify due to their shape. Only the position marking (riser, ground ring, ground chain) need be applied.

Documentation

The inspection form developed for earlier mooring inspections was modified to concentrate the data on one sheet (Figure 6). The forms were reproduced on a waterproof writing paper which allowed data to be recorded on the surface or underwater. The form has space for a riser type or telephone type mooring with four legs. The higher class moorings require two sheets. The waterproof writing paper used by the UCT's is called Underwater Ascot 31073 and is available from Appleton Papers, Inc., Appleton, Wisconsin 54911, Telephone (414) 734-9841.

An example of the required pre-inspection information is given in Figure 7. This type of information may also be taken from drawings of the mooring. In addition to this information a chart should be provided giving the present locations of the moorings. The information provided by the parts list allows the inspector to select the appropriate caliper sizes before the dive.

An example of a completed inspection sheet is shown in Figure 8. Note that a check is made for each of the three (3) single link and double link checks made at each location even if they are all the same. Double link measurements were not made at the wearpoint as this chain was on the bottom and could be slack. Measuring double link thickness of slack chain would not give a reliable measurement. Also note that NI (not inspected) is placed after the anchor size and type. The anchors were buried so no check could be made.

To number the legs of the mooring the following convention should be used. Label the legs 1, 2, 3, ... consecutively starting at true north and working clockwise (from 0^{o} to 360^{o}). The surface tenders will have to keep track of the order in which the diving team is doing the inspection and label the ground legs on the divers data sheet appropriately when they surface.

Figure 9 is a sketch of the mooring layout made from the sextant sights taken on the marker buoys attached to the ground legs. When the current is slack sights can be made on the diver's bubbles.

The parts lists, inspection sheets, and mooring layouts should be compiled with any other pertinent information and delivered to the engineer PWC, or other cognizant activity for analysis. CHESNAVFACENGCOM FPO-1 is to receive a copy of each underwater inspection report. In the analysis the downgrading of mooring classifications, or minor and major overhauls are recommended. Once again such assessments are made only by the engineer and should not be expected from the diving inspectors.

RECOMMENDATIONS AND CONCLUSIONS

The procedures and documentation given are provided to insure that the Navy's Fleet moorings receive an inspection suitable for making maintenance decisions. These guidelines are provided for use until the Fleet Mooring Maintenance Manual, MO-124 can be revised. Universal use of these inspection guidelines in the interim will promote the ease of data handling and retrieval. It is understood modifications to these procedures will be necessary in time and for unusual mooring configurations. To keep the documentation standardized suggested changes should be forwarded to the Naval Facilities Engineering Command, Code 1002 or to CHESNAVFACENGCOM FPO-1 for consideration.

REFERENCES

1. Civil Engineering Laboratory. Technical Memorandum 42-77-3, "Apra Harbor Mooring Inspection", by R. J. Taylor and R. J. Malloy, Port Hueneme, CA, February 1977.

2. Civil Engineering Laboratory. Technical Memorandum 42-78-12, "San Diego Fleet Mooring Inspection", by J. F. Wadsworth, Port Hueneme, CA, August 1978.

3. Naval Facilities Engineering Command, Design Manual, Harbor and Coastal Facilities, DM-26, July 1968.

Table 1. Caliper Settings for Components of Riser-Type Moorings (Double Values Above for Double Link Measurements)

Class Mooring	Percent Remaining	Top of Buoy			Riser [3] Chain	Ground Ring			Ground Tackle		Anchor [2]	
		F-Shackle	End Link	AJL [1]		AJL [1]	Ring	Spider	Chain [3]	AJL [1]	Stockless w/Stabilizer	LWT
A-A	100	5 3/8	4¼	4"	4	4"	6½	4 3	2 3/4	2 3/4"		
	90	4.838	3.285	type	3.6	type	5.85	3.6 2.7	2.475	type	25,000	-
	80	4.3	2.92		3.2		5.2	3.2 2.4	2.2			
B-B	100	4 15/16	3 15/16	3½"	3½	3½"	6½	4 3	2½	2½"		
	90	4.44	3.544	type	3.15	type	5.85	3.6 2.7	2.25	type	20,000	13,000
	80	3.75	3.15		2.8		5.2	3.2 2.4	2.0			
C-C	100	4 15/16	3 15/16	3½"	3½	3½"	6½	4 3	2¼	2¼"		
	90	4.44	3.544	type	3.15	type	5.85	3.6 2.7	2.025	type	18,000	10,000
	80	3.95	3.15		2.8		5.2	3.2 2.4	1.8			
D-D	100	4 3/16	3 3/4	3"	3	3"	6		3	3"		
	90	3.769	3.375	type	2.7	type	5.4	-	2.7	type	30,000	-
	80	3.35	3		2.4		4.8		2.4			
A	100	3 7/8	3 3/8	2 3/4"	2 3/4	2 3/4"	5½		2 3/4	2 3/4"		
	90	3.488	3.038	type	2.475	type	4.95	-	2.475	type	25,000	-
	80	3.1	2.7		2.2		4.4		2.2			
B	100	3½	3 1/8	2½"	2½	2½"	4 3/4		2½	2½"		
	90	3.15	2.813	type	2.25	type	4.275	-	2.25	type	20,000	13,000
	80	2.8	2.5		2.0		3.8					
C	100	3 1/8	2 3/4	2¼"	2¼	2¼"	4½		2¼	2¼"		
	90	2.813	2.813	type	2.025	type	4.05	-	2.025	type	18,000	10,000
	80	2.5	2.5		1.8		3.6	-	1.8			
D	100	2 13/16	2½	2"	2	2"	4		2	2"		
	90	2.531	2.25	type	1.8	type	3.6		1.8	type	13,000	6,000
	80	2.25	2.0		1.6		3.2		1.6			
E	100	2 7/16	2¼	1 3/4"	1 3/4	1 3/4"	3½		1 3/4	1 3/4"		
	90	2.174	2.025	type	1.575	type	3 15	-	1.575	type	9,000	4,000
	80	1.95	1.8		1.4		2.8		1.4			
F	100	1 3/4	1 3/4	1¼"	1¼	1¼"	2 3/4		1¼	1¼"		
	90	1.575	1.575	type	1.125	type	2.813	-	1.125	type	5,000	2,000
	80	1.4	1.4		1.0		2.5		1.0			
G	100	1 1/16	.1	3/4"	3/4	3/4"	1 7/8		3/4	1"		
	90	.956	.9	type	.675	type	1.688	-	.675	type	3,000	300
	80	.85	.8		.6		1.5		.6			

1. AJL measurement vary according to manufacturer, see DM-26
2. Assumes firm sand bottom
3. Assumes cast steel chain

Table 2. Caliper Settings for Components of Telephone-Type Moorings (Double Values for Double Link Measurements)

Class Mooring	Percent Remaining	Top of Buoy		Buoy-to-Ground Tackle			Ground Tackle		Anchor[2]	
		End Link	AJL[1]	D/F-Shackle	AJL[1]	Spider	AJL[1]	Chain[3]	Stockless/Stabilizer	LWT
A-A	100	4¼	4"	4 11/16	4"	4 3	2 3/4"	2 3/4		
	90	3.285	type	4.219	type	3.6 2.7	type	2.475	25,000	-
	80	2.92		3.75		3.2 2.4		2.2		
B-B	100	4¼	4"	4 11/16	3½"	4 3	2½"	2½		
	90	3.285	type	4.219	type	3.6 2.7	type	2.25	20,000	13,000
	80	2.92		3.75		3.2 2.4		2.0		
C-C	100	4¼	4"	4 11/16	3½"	4 3	2¼"	2¼		
	90	3.285	type	4.219	type	3.6 2.7	type	2.025	18,000	10,000
	80	2.92		3.75		3.2 2.4		1.8		
D-D	100	4¼	4"	4 11/16	3"		3"	3		
	90	3.285	type	4.219	type		type	2.7	30,000	-
	80	2.92		3.75				2.4		
A	100	3 3/8	3½"	3 7/8	2 3/4"		2 3/4"	2 3/4		
	90	3.038	type	3.488	type		type	2.475	25,000	-
	80	2.7		3.1				2.2		
B	100	3 3/8	3½"	3½	2½"		2½"	2½		
	90	3.038	type	3.15	type		type	2.25	20,000	13,000
	80	2.7		2.8				2.0		
C	100	3 3/8	3½"	3 1/8	2¼"		2¼"	2¼		
	90	3.038	type	2.813	type		type	2.025	18,000	10,000
	80	2.7		2.5				1.8		
D	100	3 3/8	3½"	2 13/16	2"		2"	2		
	90	3.038	type	2.531	type		type	1.8	13,000	6,000
	80	2.7		2.25				1.6		

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Table 2. Caliper Settings for Components of Telephone-Type Moorings (Double Values for Double Link Measurements)

Class Mooring	Percent Remaining	Top of Buoy		Buoy-to-Ground Tackle				Ground Tackle		Anchor[2]	
		End Link	AJL[1]	D/F-Shackle	AJL[1]	Spider		AJL[1]	Chain[3]	Stockless/Stabilizer	LWT
A-A	100	4¼	4"	4 11/16	4"	4	3	2 3/4"	2 3/4		
	90	3.285	type	4.219	type	3.6	2.7	type	2.475	25,000	-
	80	2.92		3.75		3.2	2.4		2.2		
B-B	100	4¼	4"	4 11/16	3½"	4	3	2½"	2½		
	90	3.285	type	4.219	type	3.6	2.7	type	2.25	20,000	13,000
	80	2.92		3.75		3.2	2.4		2.0		
C-C	100	4¼	4"	4 11/16	3½"	4	3	2¼"	2¼		
	90	3.285	type	4.219	type	3.6	2.7	type	2.025	18,000	10,000
	80	2.92		3.75		3.2	2.4		1.8		
D-D	100	4¼	4"	4 11/16	3"			3"	3		
	90	3.285	type	4.219	type			type	2.7	30,000	-
	80	2.92		3.75					2.4		
A	100	3 3/8	3½"	3 7/8	2 3/4"			2 3/4"	2 3/4		
	90	3.038	type	3.488	type			type	2.475	25,000	-
	80	2.7		3.1					2.2		
B	100	3 3/8	3½"	3½	2½"			2½"	2½		
	90	3.038	type	3.15	type			type	2.25	20,000	13,000
	80	2.7		2.8					2.0		
C	100	3 3/8	3½"	3 1/8	2¼"			2¼"	2¼		
	90	3.038	type	2.813	type			type	2.025	18,000	10,000
	80	2.7		2.5					1.8		
D	100	3 3/8	3½"	2 13/16	2"			2"	2		
	90	3.038	type	2.531	type			type	1.8	13,000	6,000
	80	2.7		2.25					1.6		

1. AJL measurements vary according to manufacturer, see DM-26
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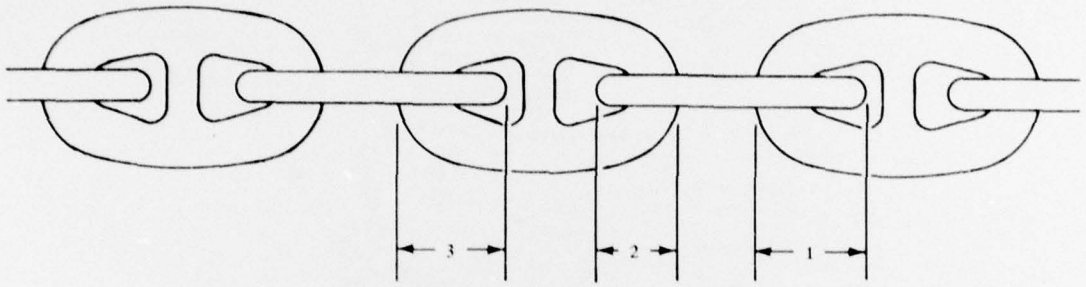
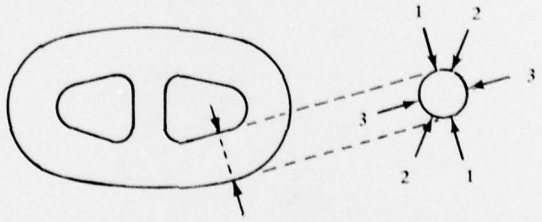


Double Link Measurement



Single Link Measurement

Figure 1. Locations for taking chain link measurements.

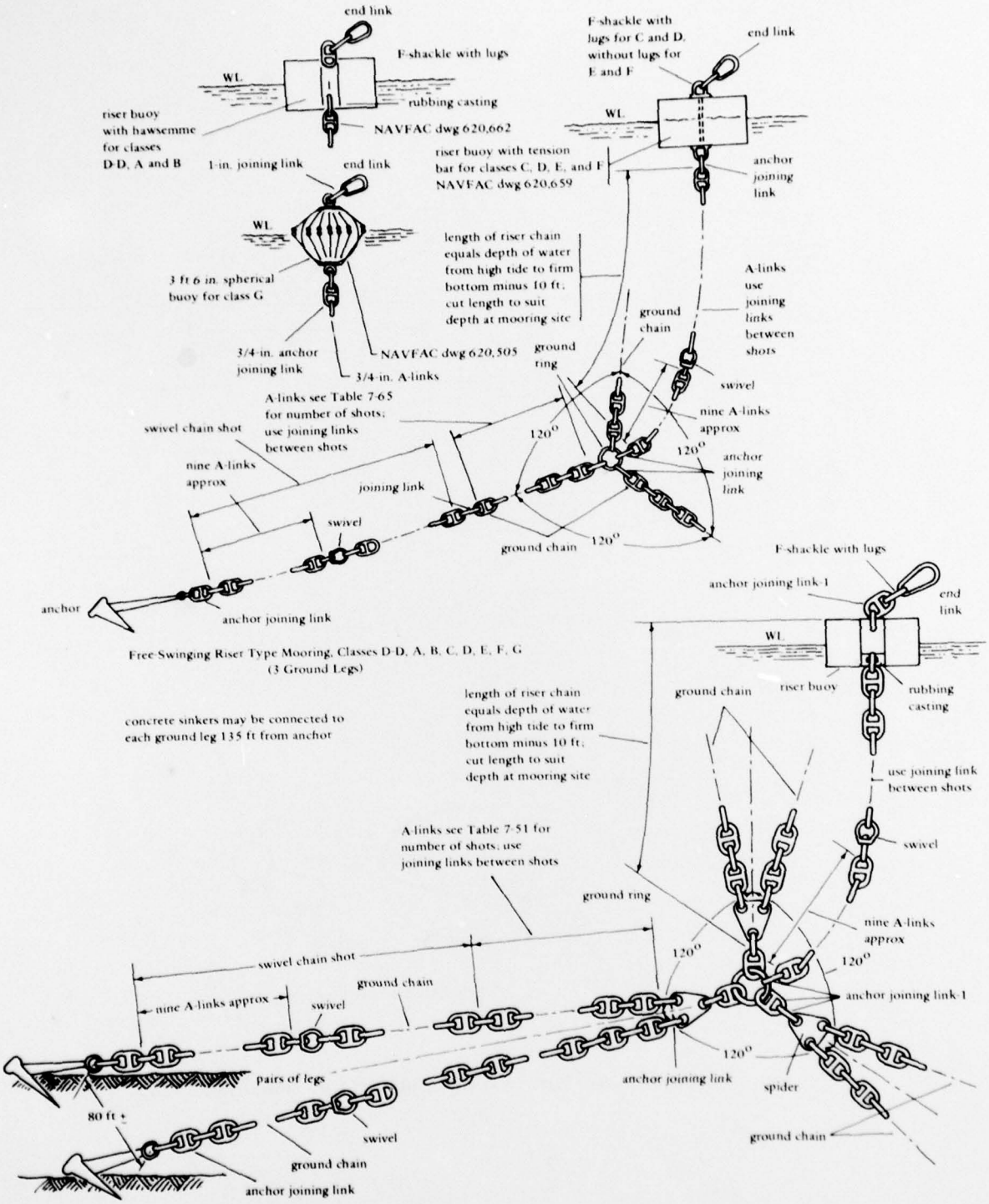


Figure 2. Free-swinging riser-type mooring, classes A-A, B-B, and C-C (6 ground legs).

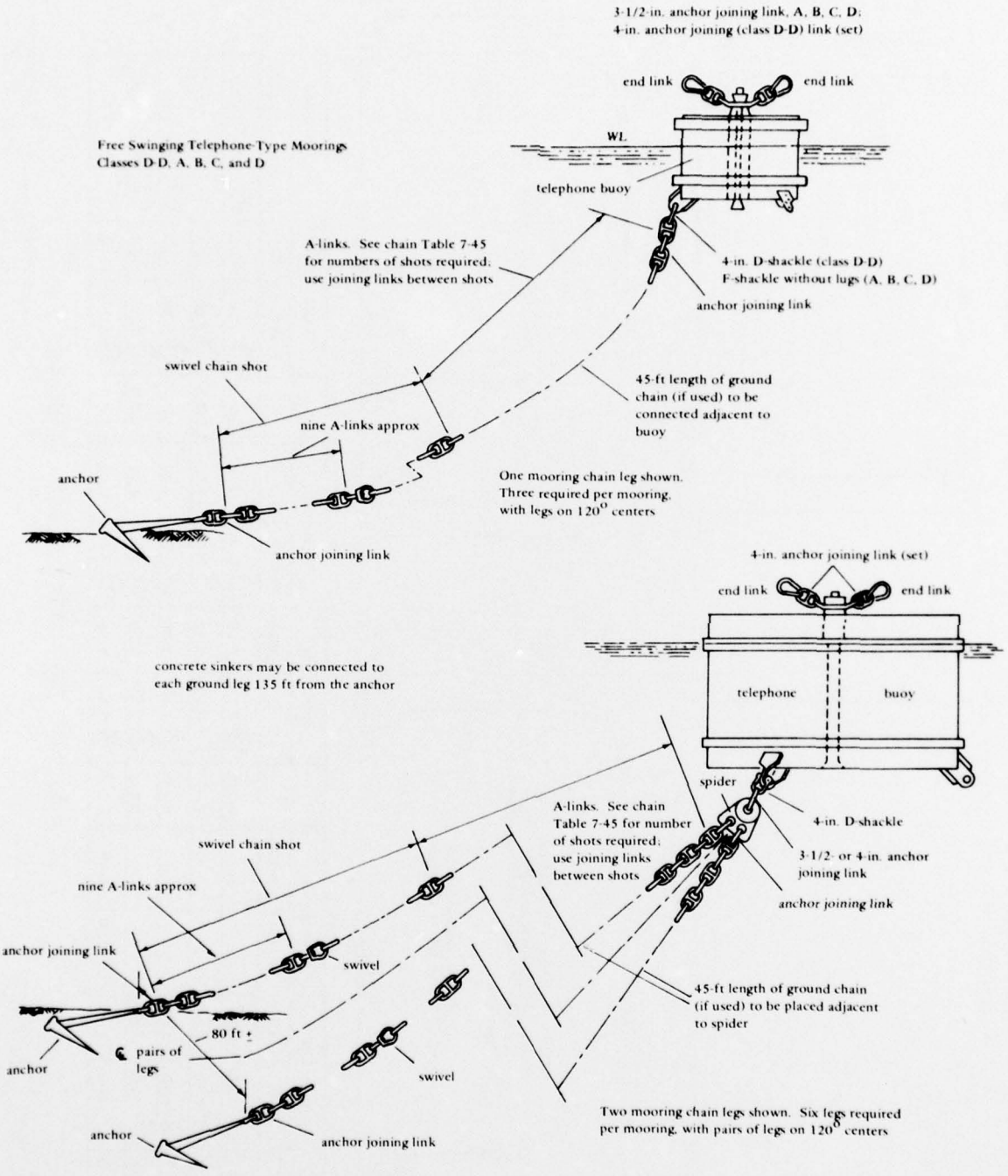
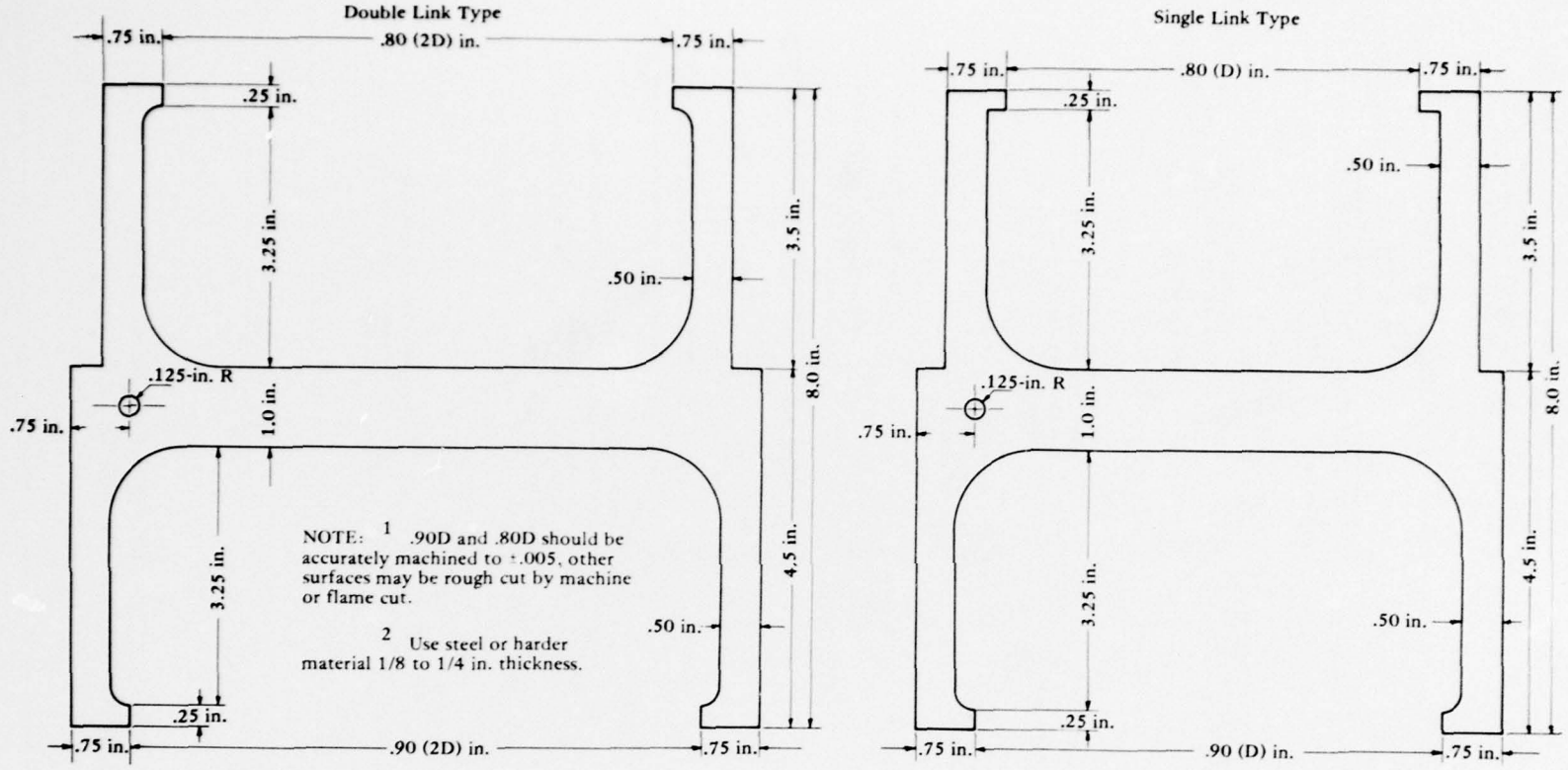


Figure 3. Free-swinging telephone-type mooring, classes A-A, B-B, and C-C.



D''	Single Link		Double Link		D''	Single Link		Double Link		D''	Single Link		Double Link	
	.90D	.80D	.90(2D)	.80(2D)		.90D	.80D	.90(2D)	.80(2D)		.90D	.80D	.90(2D)	.80(2D)
6-1/2	(1) 5.85	5.20	—	—	3-1/2	(6) 3.15	2.80	(17) 6.30	5.60	2	(11) 1.80	1.60	(22) 3.60	3.20
6	(2) 5.40	4.80	—	—	3	(7) 2.70	2.40	(18) 5.40	4.80	1-7/8	(12) 1.69	1.50	—	—
5-1/2	(3) 4.95	4.40	—	—	2-3/4	(8) 2.48	2.20	(19) 4.96	4.40	1-3/4	(13) 1.58	1.40	(23) 3.06	2.80
4-1/2	(4) 4.05	3.60	—	—	2-1/2	(9) 2.25	2.00	(20) 4.50	4.00	1-1/2	(14) 1.35	1.20	(24) 2.70	2.40
4	(5) 3.60	3.20	(16) 7.20	6.40	2-1/4	(10) 2.03	1.80	(21) 4.06	3.60	1-1/4	(15) 1.125	1.00	—	—

Figure 4. UCT TWO - 80% and 90% calipers.

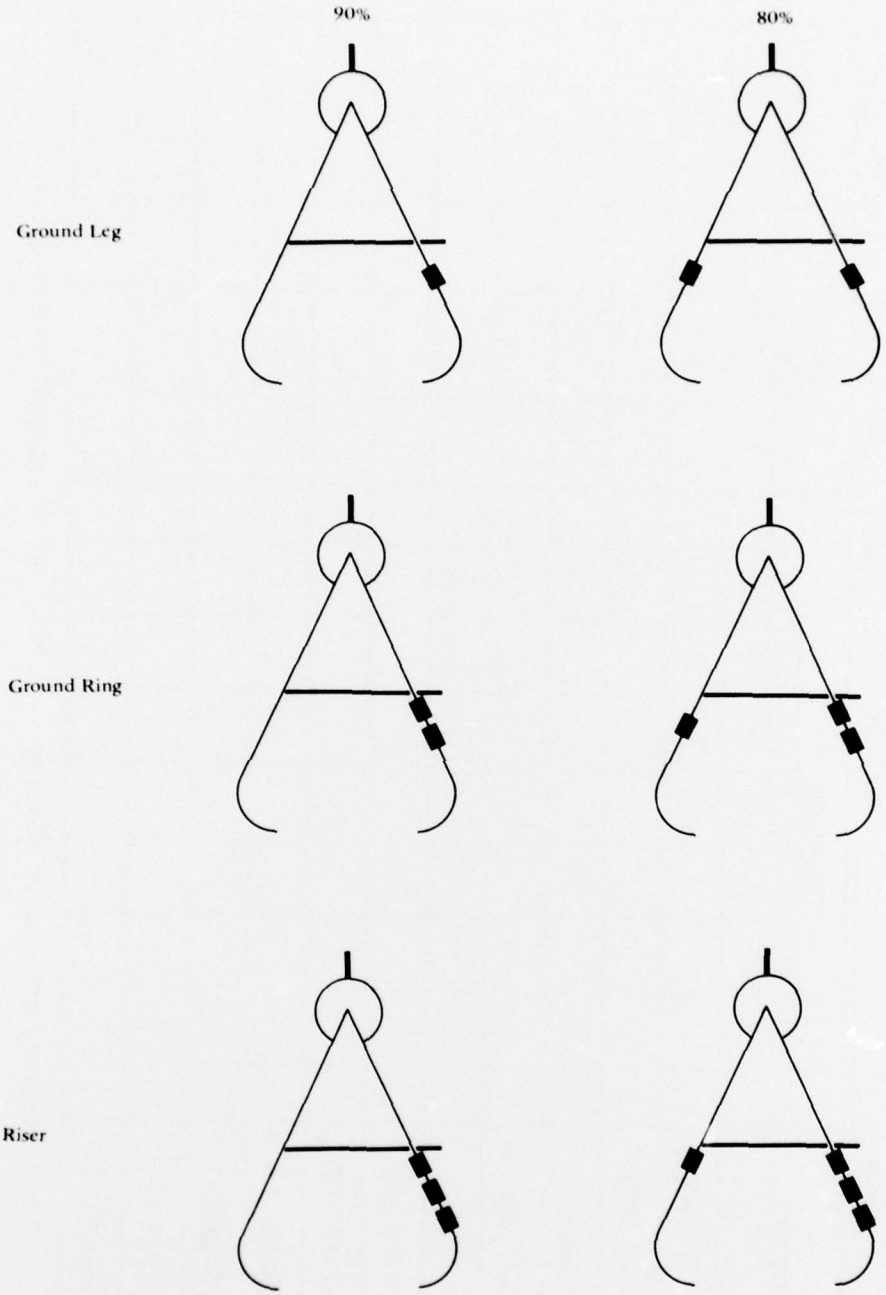


Figure 5. Caliper coding.

MOORING NO.:_____ CLASS:_____ LOCATION:_____ LAT:_____ LONG:_____

WATER DEPTH:_____ TYPE MOORING: ☐ RISER ☐ TELEPHONE ANCHOR SIZE/TYPE:_____

DATE:_____ DIVER:_____ BOTTOM TYPE: ☐ SAND ☐ MUD ☐ CLAY ☐ CORAL ☐ ROCK

COMPONENTS		NI	CONDITION								U/W VOLTMETER READINGS			COMMENTS
			NEW	SINGLE LINK %			DOUBLE LINK %			D				
				90+	80+	80-	90+	80+	80-		1	2	3	
BUOY-TOP HARDWARE														
RISER	NEAR BUOY													
	MIDDLE													
	NEAR GRD RG													
GROUND RING														
GROUND LEG NO. __	UPPER END													
	WEARPOINT													
GROUND LEG NO. __	UPPER END													
	WEARPOINT													
GROUND LEG NO. __	UPPER END													
	WEARPOINT													

D = destroyed, broken, or missing NI = not inspected, inaccessible

Figure 6. Underwater inspection reporting form.

MOORING DM-3

RISER TYPE - CLASS "D"

3 LEGS

MATERIAL COST
$32,700

LEG "A" DETAILS

3" Bending Shackle
2½" NACO A. J. Link
2¼" Pear Link
2¼" Detachable Link
90' --2" C. S. Chain
2¼" Detachable Link
90' --2' C. S. Chain
2¼" Detachable Link
2¼" Pear Link
3" Bending Shackle
13,000# IMP. Stockless Anchor

LEG "B" DETAILS

3" Bending Shackle
2¼" Pear Link
2¼" Detachable Link
90' --2" C. S. Chain
2¼" Detachable Link
89' --2' C. S. Chain
2¼" Detachable Link
2¼" Pear Link
2½" NACO A. J. Link
13,000# IMP. Stockless Anchor

LEG "C" DETAILS

3" Bending Shackle
2½" NACO A. J. Link
2¼" Pear Link
2¼" Detachable Link
76' -- 2" C. S. Chain
2" Detachable Link
2¼" Pear Link
2½" Bending Shackle
13,000# IMP. Stockless Anchor

RISER CHAIN DETAILS

Drum Buoy (Small) W/Tension Bar
2½" NACO A. J. Link
27' --2½" C.S. Riser Chain
2½" Detachable Link
2½" E. Z. Link
2 9/16" Pear Link
3" Bending Shackle
4 3/4" x 18" I.D. Ground Ring

HISTORY:

3/15/55	New Installation
11/13/60	Reconditioned and Relaid
2/12/64	Reconditioned and Relaid
11/3/66	Reconditioned and Relaid
4/3/74	Reconditioned and Relaid

Figure 7. Parts list of a fleet mooring.

MOORING NO.: DM-3 CLASS: D LOCATION: Deperming Pier LAT: 32°41'36.3"N LONG: 117°14'12.4"W

WATER DEPTH: 38' TYPE MOORING: ☑ RISER ☐ TELEPHONE ANCHOR SIZE/TYPE: NI

DATE: 4/20/78 DIVER: EO2 Alley/CE2 Armstrong BOTTOM TYPE: ☐ SAND ☑ MUD ☐ CLAY ☐ CORAL ☐ ROCK

COMPONENTS		NI	CONDITION								U/W VOLTMETER READINGS			COMMENTS
			NEW	SINGLE LINK %			DOUBLE LINK %			D				
				90+	80+	80-	90+	80+	80-		1	2	3	
BUOY-TOP HARDWARE				Good condition. Guano clogging scuppers on top fender.										
RISER	NEAR BUOY			✓✓			✓✓				0.618	0.618	0.619	
	MIDDLE			✓✓				✓✓			0.617	0.617	0.617	
	NEAR GRD RG				✓✓			✓✓			0.617	0.617	0.618	
GROUND RING				✓✓							0.617	0.617	0.618	
GROUND LEG NO. __	UPPER END			✓✓			✓✓				0.618	0.617	0.618	
	WEARPOINT			✓✓							0.608	0.608	0.608	
GROUND LEG NO. __	UPPER END			✓✓			✓✓				0.617	0.617	0.618	
	WEARPOINT			✓✓							0.610	0.609	0.610	
GROUND LEG NO. __	UPPER END			✓✓			✓✓				0.617	0.617	0.618	
	WEARPOINT			✓✓							0.615	0.615	0.615	

D = destroyed, broken, or missing NI = not inspected, inaccessible

Figure 8. Example of a completed inspection sheet.

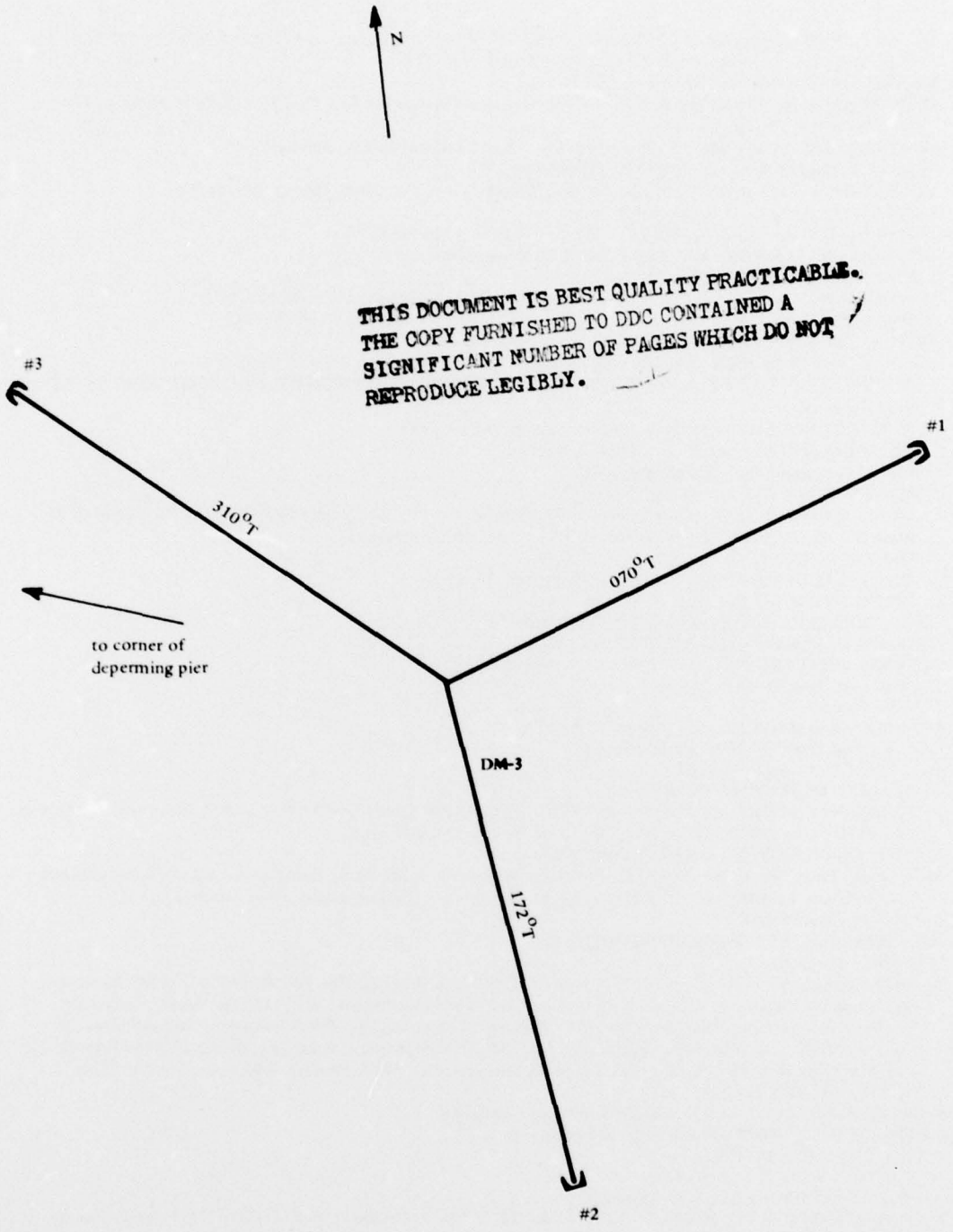


Figure 9. Sketch of mooring layout.

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